

REMARKS

In the present Amendment, the specification has been replaced with a substitute specification. The substitute specification includes no new matter. A marked up version of the specification is included herewith.

Claim 5 has been amended to recite --in an amount from about 25,000 to about 160,000 parts--. This amendment is supported by the original specification at, for example, page 7, 2nd full paragraph. Claim 5 has also been amended to replace “by” with --in--.

Claim 7 has been amended to recite a mill selected from --the group consisting of--.

Claims 8 and 9 have been amended to delete the word “type.”

Claim 9 has been amended to specify an inorganic oxide as --alumina--. Claim 9 has also been amended to replace “by” and “in a dry way” with --in-- and --under dry conditions--, respectively.

Claim 10 has been amended to specify an inorganic oxide as --alumina--. Claim 10 has also been amended to recite an alkoxide method --comprising a step of hydrolyzing an organoaluminium compound--. This amendment is supported by the original specification at, for example, page 6, lines 6-7.

No new matter has been added and thus, entry of the Amendment is respectfully submitted to be proper. Upon entry of the Amendment, Claims 5-10 will be all the claims pending in the application.

At page 2 of the Office Action, the disclosure has been objected to for alleged informalities. Specifically, it was asserted that it is unclear what “ ϕ ” means in “mm ϕ ” at page 17, line 6 and page 21, line 1.

Applicants respectfully traverse the objection. As described on page 9 of the original specification, lines 18-22, “mm ϕ ” is a unit of diameter of pulverization medium. Accordingly, the Examiner is respectfully requested to reconsider and withdraw the objection to the term.

At page 2 of the Office Action, the Examiner required a substitute specification.

Applicants have herewith submitted a substitute specification. It is respectfully submitted that the substitute specification (without claims and Abstract) contains no new matter and that it includes the same changes as are indicated in the attached marked-up copy of the original specification (without claims and Abstract).

Accordingly, the Examiner is respectfully requested to reconsider and withdrawn the objection to the specification.

At page 2 of the Office Action, Claim 4 has been objected to as allegedly being in improper dependent form.

The objection is moot, because in this Amendment, Applicants have cancelled Claim 4. Accordingly, the objection should be withdrawn.

On page 2 of the Office Action, Claims 1-10 have been objected to for alleged informalities.

Applicants respectfully submit that Claims 5-10 as amended are proper. In this Amendment, Applicants have amended to replace “by the dry-way pulverizer” in Claim 5 and

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“in a dry-way” in Claim 9, with --in the dry-way pulverizer-- and --under dry conditions--, respectively, as suggested by the Examiner. Applicants have also amended Claim 9 to replace “by a medium-stirring-type pulverizer” with --in a medium-stirring pulverizer--, for clarity. Applicants have cancelled Claims 1-4.

Accordingly, the Examiner is respectfully requested to reconsider and withdraw the objection to Claims 5-10.

On page 3 of the Office Action, Claims 1-4 and 8-10 (apparently Claims 1-4 and 7-10) have been rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite.

Applicants respectfully submit that Claims 7-10 as amended are not indefinite. In this Amendment, Applicants have amended Claim 7 to use proper Markush language; Claims 8 and 9 to delete the word “type”; and Claim 10 to recite a positive step for the alkoxide method, as suggested by the Examiner. Applicants have cancelled Claims 1-4.

Accordingly, the Examiner is respectfully requested to reconsider and withdrawn the rejection to Claims 7-10.

At page 4 of the Office Action, Claims 1-10 have been rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Hill ‘964.

Applicants respectfully submit that Claims 5-10 as amended are not obvious over Hill.

Present invention recited in Claim 5

The present invention recited in Claim 5 provides a method for producing an inorganic oxide powder which comprises a step of continuously introducing into a dry-way pulverizer, an inorganic oxide in an amount of 100 parts by volume and air, nitrogen or a gas mixture thereof in

an amount of from about 25,000 to about 160,000 parts by volume to pulverize the inorganic oxide in the dry-way pulverizer.

An object of the present invention is to provide a method producing efficiently an inorganic oxide powder suitable as a raw material for a high-density ceramic (page 15, lines 5-8).

When the step of the present invention is carried out, an inorganic oxide is pulverized in a dry-way pulverizer during continuous introduction of the inorganic oxide and a gas into the pulverizer in a specific ratio thereof (page 6, line 21-page 7, line 1).

When the amount of continuously introduced gas is less than about 25,000 parts by volume or more than about 160,000 parts by volume, based on 100 parts by volume of the inorganic oxide, the density of a ceramic obtained after molding and sintering the inorganic oxide powder decreases (page 7, line 17-page 8, line 3).

Hill discloses a process of milling alumina powder with high transmissive energy mill such as a Spex mill. It is described in Example II, that "[i]n order to demonstrate the effect of dry, high transmissive energy milling upon the crystalline structure of alumina, a charge of high purity alpha alumina powder (Linde 'A') having an average particle size of 0.3 micron was milled dry in a Spex mill (air atmosphere) for periods of time up to 3 hours."

However, Hill does not teach or suggest that milling is carried out during introducing continuously the inorganic oxide and the gas into the pulverizer.

Further, Hill does not teach or suggest that milling is carried out during introducing into a dry-way pulverizer, an inorganic oxide in an amount of 100 parts by volume and air, nitrogen or a gas mixture thereof in an amount of from about 25,000 to about 160,000 parts by volume.

Since the process disclosed in Hill is batch-wise, Applicants submit that a volume ratio (volume of gas/volume of inorganic oxide) must be smaller than that of the present invention recited in Claim 5. In order to achieve a volume ratio of 25,000 in a batch-wise mill as described in Example I of Hill, it is essential that a mill has more than a 90 liter volume, which equals the total volume of alumina, gas and pulverization medium. Milling only 15 g alumina with an about 90-liter volume mill is not efficient. Volume of gas is calculated as follows:

$90 \text{ liter} = 90000 \text{ cm}^3 = 15 \text{ g (alumina)} / 4 \text{ g/cm}^3 \text{ (density of alumina)} \times 25000 \text{ (volume ratio)}$

In view of the above, Applicants submit that the present invention is not obvious over Hill. The Examiner is respectfully requested to reconsider and withdraw the rejection of Claims 5-8.

Present invention recited in Claim 9

The present invention recited in Claim 9 provides a method for producing an alumina powder which comprises a step of pulverizing an alumina oxide with purity of about 99.9% or higher and a BET specific surface area of from about 1 to about 70 m²/g in a medium-stirring pulverizer under dry conditions at a specific energy consumption of from about 0.3 to about 1 kWh/kg.

In the present invention, specific alumina oxide is pulverized in a medium-stirring pulverizer under dry conditions at a specific energy consumption of from about 0.3 to about 1 kWh/kg to obtain an alumina powder suitable as a raw material for a high-density alumina ceramic.

When alumina oxide is pulverized under the same conditions, but at a specific energy consumption not within from about 0.3 to about 1 kWh/kg, the density of an alumina ceramic obtained after molding and sintering the alumina powder decreases.

For example, the density of an alumina ceramic obtained is 3.95 g/cm^3 in Example 6 wherein the specific energy consumption is 0.64 kWh/kg. On the other hand, the density of an alumina ceramic obtained is 3.87 g/cm^3 in Comparative Example 1 wherein the specific energy consumption is 1.08 kWh/kg.

Further, Applicants submit that the same type of mill does not necessarily have the same specific energy consumption, because specific energy consumption is directly proportional to pulverizing time (i.e., retention time in pulverization chamber), but inversely proportional to feed rate of alumina.

A ratio (pulverizing time/feed rate) of Example 1 in the present specification is different from that of Example 1 of Hill. The former ratio is 1h/kg (15h/15kg), while the latter ratio is 100h/kg (90min/15g). Accordingly, Hill discloses milling at a higher energy consumption than the present invention.

Retention time of Example 1 is calculated as follows:

$$15\text{h} = 25000 \text{ cm}^3 \text{ (inner capacity of pulverization chamber)} \div [6500\text{g/h (feed rate of alumina)} \div 4 \text{ g/cm}^3 \text{ (density of alumina)}]$$

Still further, Hill discloses “[m]illing should be continued well beyond the threshold point” (column 4, lines 25-26) and “continuing the milling for a period beyond the threshold point of the powder constitutes such that the constituent powder particles undergo substantial

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mechanical cold bonding in the solid state” (Claim 1 of Hill). That is, Hill suggests that milling is carried out to bond particles together.

On the other hand, in the present invention, alumina oxide is pulverized in a medium-stirring pulverizer. Accordingly, the present invention is different from Hill with regard to the effects of a step operated in a medium-stirring pulverizer.

Further, as discussed above, the larger specific energy consumption recommended in Hill is improper in the present invention (Comparative Example 1).

In view of the above, Applicants submit that the present invention is not obvious over Hill. The Examiner is respectfully requested to reconsider and withdraw the rejection of Claims 9 and 10.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

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